DRAFT

STATUS OF THE WATER SUPPLY
OF
SOUTHEASTERN NEW JERSEY
Executive Summary

SEPTEMBER 2003

State of New Jersey
James E. McGreevey, Governor

NJDEP of Environmental Protection
Bradley M. Campbell, Commissioner

Land Use Management
Ernest Hahn, Assistant Commissioner

Division of Watershed Management
Lawrence Baier, Director
Robert Kecskes, Section Chief – Principal Report Author

New Jersey Department of Environmental Protection
Land Use Management
Division of Watershed Management
P.O. Box 418
Trenton, 08625-0418

Printed on Recycled Paper

Water is the foundation of life on earth. It is what separates the earth as a "living planet" from all other known planets. The limited freshwater resource is not only essential to human health, safety, prosperity and quality of life, but is also essential to the health of

the ecosystem and the environment surrounding us. In fulfilling its environmental protection mandate, the New Jersey Department of Environmental Protection, (NJDEP) is obligated to ensure that the water resource is protected in quantity and quality to meet all of these uses. The frequency and severity of recent drought episodes may indicate that human use of the water resource in certain areas is approaching the limit of the resource's ability to sustain a healthy ecosystem.

One such area of concern was identified on September 22, 2002 through Governor McGreevey's Executive Order 32 (EO 32), which required the Commissioner of the Department of Environmental Protection to assess the adequacy of the water supply in relation to approved and anticipated growth in Egg Harbor, Galloway and Hamilton Townships, in Atlantic County. This Order was accompanied by Commissioner Campbell's Administrative Order 22 which generally prohibited the distribution of water in Egg Harbor, Galloway and Hamilton Townships pending termination of the state of water emergency in those townships and a determination that water supply for those townships is adequate pursuant to EO 32.

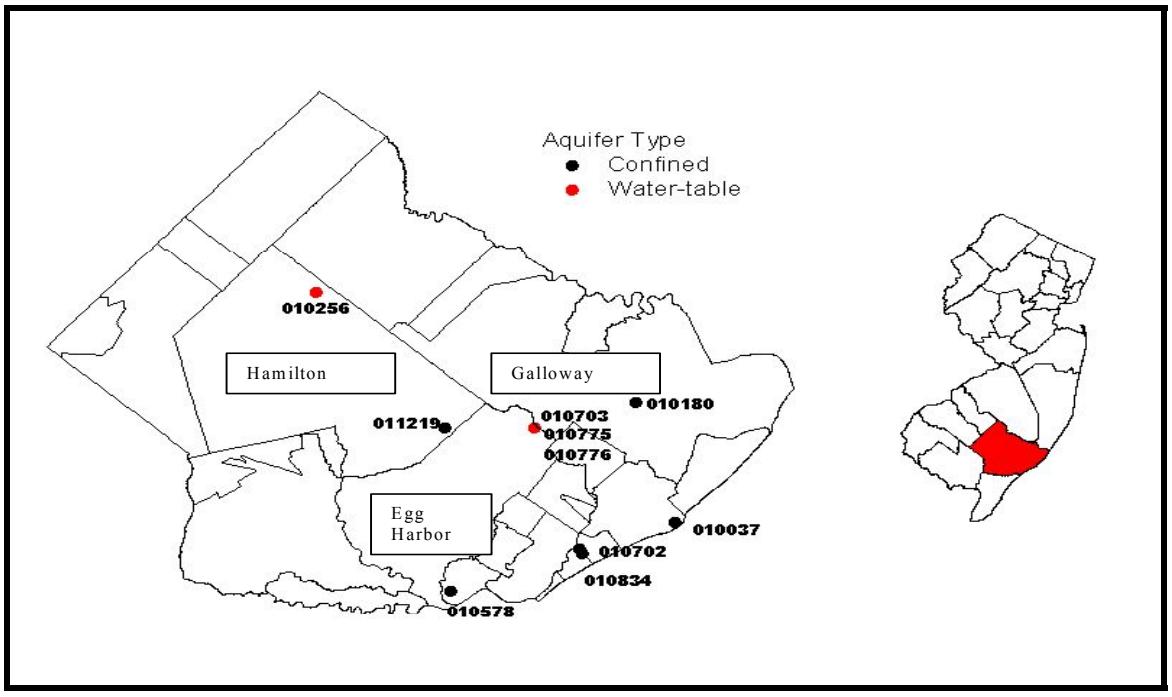

Figure 1 Map of Atlantic County labeling Hamilton, Galloway and Egg Harbor Townships together with the locations of USGS observation wells.

The water supply concerns facing this region are not new. The 1982 NJ Statewide Water Supply Master Plan identified Atlantic City and 13 nearby coastal communities as an area with potential water supply problems as a result of the substantial growth in this area, as well as that expected in the decades to come. The primary concerns identified in the 1982 Plan were the potential for: a) saltwater intrusion that could impair barrier island and near-shore wells in the Atlantic City 800-foot sand aquifer; b) ground water

contamination of the water table aquifer; and c) reductions in stream flow as a result of pumpage from the Kirkwood-Cohansey water table aquifer.

Purpose

This report is intended to satisfy the requirements of EO 32. It identifies water supply issues and impacts associated with the withdrawals from Egg Harbor, Galloway and Hamilton Townships as well as the region that shares its water supply. Given the limited time available to conduct this assessment, this report relies heavily on existing information. Based on that information, both immediate and long-term steps are recommended to ensure that the water resources of this region remain sustainable for future generations. To fully assess the water supply available in the study area a far more comprehensive regional study and plan are necessary. This comprehensive plan will take three to four years to complete. Therefore, the interim recommendations in this Report are intended to ensure that a safe and adequate supply of drinking water is protected for the region, while decreasing the likelihood of crossing a threshold of significant environmental impact during the pendency of the comprehensive plan. Several studies are also currently underway, including water budgets and ecological flow goals that will better inform the conclusions of this assessment. As these studies are completed the conclusions of this report should be revisited and adjusted as necessary to reflect newer information.

Study Area

Egg Harbor, Galloway and Hamilton Townships largely depend on two ground water sources: 1) the shallow, unconfined Kirkwood-Cohansey (water table) aquifer, and 2) the deeper confined Atlantic City 800-foot sand aquifer (see figures 2 and 3). These water supplies are not "independent" resources; rather, these townships share the regional supply of southeastern New Jersey. Essentially, all users of water in the region are "sharing" the same resource. Land use and water supply decisions made in one part of the region can affect the water resources of another part of the region. Essentially the area of influence increases with the depth of the aquifer, while the acuity of the impact decreases because that impact is spread over a much wider area. For example, in the water table aquifer the area of concern is mostly limited to the watershed in which the withdrawal occurs. In the Atlantic City 800-foot sand the area of impact stretches from southern Ocean County to southern Cape May County (see figure 8). Consequently, in order to assess the adequacy of the supplies it will be necessary to expand the study area beyond the confines of Egg Harbor, Galloway and Hamilton Townships and assess the cumulative effects of all withdrawals from these supplies.

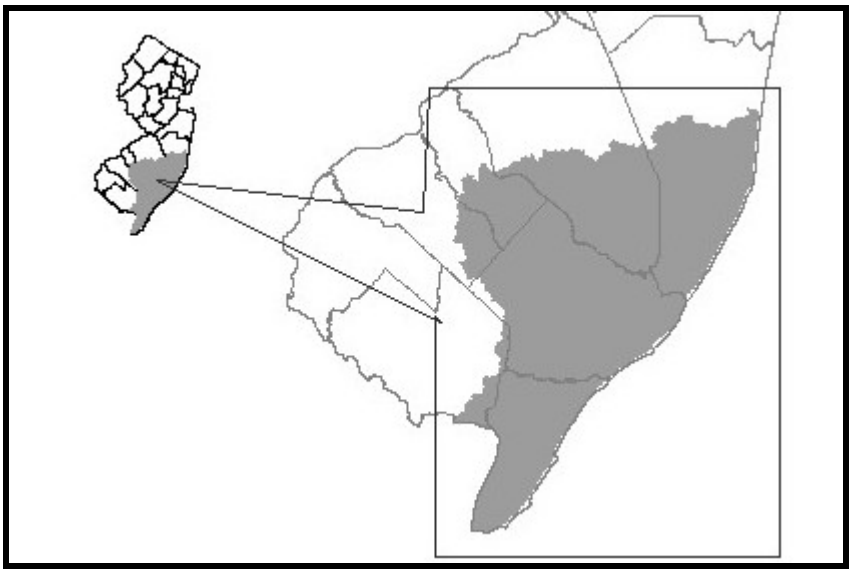

Figure 2 showing location of the Great Egg Harbor, Mullica River and Southern Barnegat Watersheds which define the study area for the Kirkwood-Cohansey Aquifer

Specifically, this report addresses the deep confined Atlantic City 800-foot sand aquifer from Cape May to Ocean County, and the shallow unconfined Kirkwood-Cohansey water table aquifer system in the entire Great Egg Harbor River, Mullica River and Southern Barnegat watersheds, thus defining the "study area." To fulfill the obligations of EO 32, specific information regarding Egg Harbor, Galloway and Hamilton Townships is also provided. However, this specific information must be viewed in the context of the overall water supply and demand of the study area.

Water Supply

Under natural conditions, streams located within the study area are commonly referred to as "gaining streams," because they rely on groundwater from the water table aquifer to provide flow during dry periods. Groundwater discharge to streams is known as base flow. Hydrologists have traditionally used base flow to approximate groundwater recharge within watersheds. Although this approach must be used with caution, base flow provides a workable estimate of recharge. Aquifer recharge is defined as precipitation minus losses due to direct runoff and evapo-transpiration. Consequently, the water table aquifer (Kirkwood-Cohansey) can generally be divided among surface watersheds for the purpose of water supply planning. Water supply withdrawals from the water table aquifer can "pirate" away from streams and wetlands, thereby reducing surface water levels significantly during dry periods (see figure 4). The impact is most pronounced in areas where groundwater is not returned in proximity to the point of withdrawal. For example, a majority of water withdrawn and used for irrigation returns to the hydrologic cycle as vapor through evapo-transpiration and is thus lost from the region's streams. In the study area, much of the water used for indoor use is conveyed via pipe to a regional sewage treatment plant and subsequently to the Atlantic Ocean. Consequently, this water is also lost from the region's streams and rivers. This reduction

in base flow can cause significant ecological changes both in the freshwater stream itself due to the lack of water depth necessary to support higher order finfish and consequent loss of habitat, in near stream environs including wetlands (Stockton, 1979/Pinelands CMP 1980) and in the estuary due to alteration of salt concentrations which can impact nursery habitat for finfish, and negatively impact shellfish growth rates and susceptibility to dermo, MSX and other parasites (USEPA, 1997).

The 1996 New Jersey Statewide Water Supply Master Plan assumed that ten percent of total groundwater recharge, referred to as the "planning yield," could be available for water supply use without causing unacceptable regional impacts such as progressive water table decline, saltwater intrusion, well loss and stream flow depletion. Applying this guidance to the study area, the resulting available water for each watershed is: Great Egg Harbor River 31.1 million gallons per day (MGD), Atlantic Coastal (aka Southern Barnegat Bay) 25 MGD, Mullica River 63.5 MGD and Cape May Coastal 29 MGD. The total amount of groundwater available in the study area is 148.6 MGD.

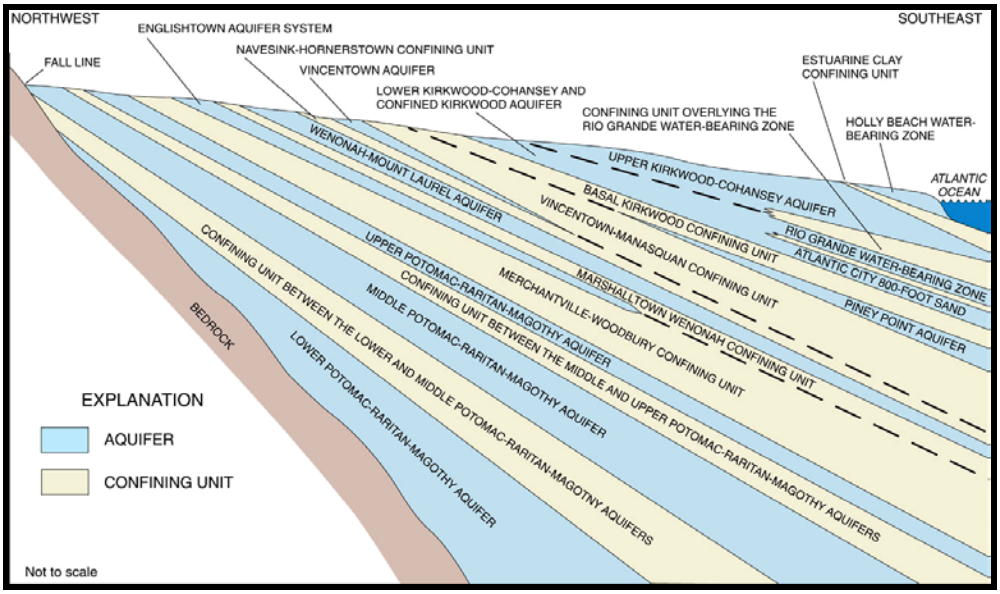

Figure 3 Cross-sectional schematic diagram of New Jersey Coastal Plain Aquifers (source USGS modified from Martin, 1998)

In addition to the available groundwater, the Atlantic City Municipal Utilities Authority operates two small reservoirs located on Absecon Creek, Kuehne Pond and Doughty Pond. Together these two reservoirs have an estimated safe yield of 9.3 MGD.

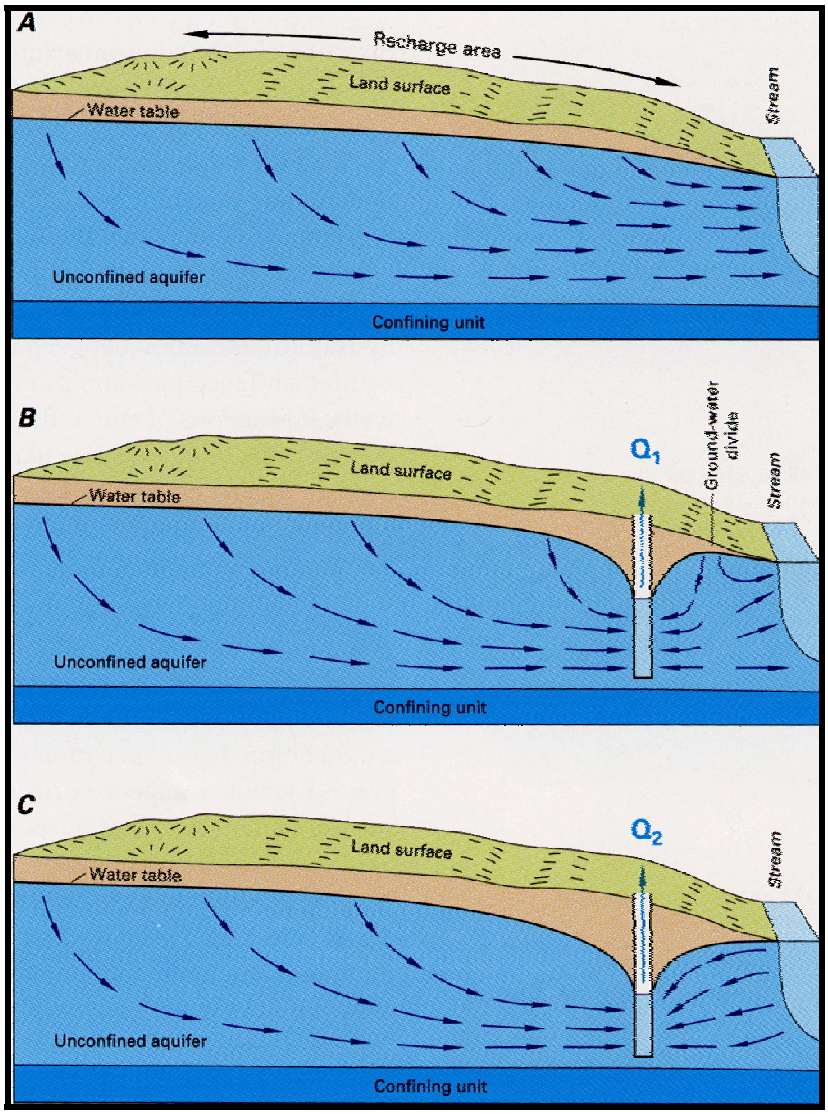

Figure 4 Hypothetical cross-sectional diagram of a water table or surficial aquifer and stream showing: (A) the natural condition of groundwater discharging to a stream (gaining stream); (B) a nearby well pumping at a rate of Q_1 that intercepts water that would have discharged to the stream; and (C) a nearby well pumping at the rate of Q_2, where Q_2 is greater than Q_1, that intercepts water that would have discharged to the stream and also induces infiltration of stream water into the aquifer (losing stream). (Source: USGS from Winter and others, 1998, Fig C-1)

The Atlantic City 800-foot sand aquifer is confined beneath eastern Atlantic County, but merges with the Kirkwood-Cohansey aquifer in the western part of the County (see figure 3). Therefore, the Atlantic City 800-foot sand also receives its recharge from the water table aquifer and is not an independent source of water. The lowering of water levels in the Atlantic City 800-foot sand aquifer causes more leakage from the overlying aquifers through the confining layer. Recharge to the Atlantic City 800-foot sand from the Kirkwood-Cohansey aquifer is believed to have increased from 4 MGD to 15 MGD due to pumping from the confined aquifer (NJGS, 2001).

TABLE 1

COMPARISON OF PLANNING YIELDS TO WATER DEMAND IN THE SOUTHEASTERN NEW JERSEY STUDY AREA

(MILLION GALLONS/DAY)

WATERSHED	TOTAL RECHARGE	PLANNING YIELD	CURRENT USE
MULLICA	634.5	63.5	95.3
CAPE MAY	289.8	29	24.1
GREAT EGG	311.4	31.1	55.8
ATL. CSTL.	249.6	25	19.4

Therefore, pumping from the Atlantic City 800-foot sands is also likely to impact surface water base flows particularly over the long term in the western portion of the county. However, due to its depth the effect is spread out over the entire region, making a direct assessment of impact on any one stream difficult to quantify. However, due to the communication between the Atlantic City 800-foot sand aquifer and the Kirkwood-Cohansey aquifer the long-term total available groundwater within the study area is not increased. However, seasonal conjunctive use of the confined aquifer and the unconfined aquifer could increase the amount of water that may be withdrawn without causing significant impacts on surface water resources.

Water Demand

Depletive water uses, (those which do not return water to the place of withdrawal), and consumptive uses, (those which lose water through evaporation and transpiration) are of greatest concern in water supply planning in the unconfined aquifer. Due to regional sewering and irrigation use, nearly all uses of water within the study area fall into one of these two categories that remove water from the watersheds. Existing water withdrawals in the study area currently average around 195 MGD distributed as follows: Great Egg Harbor 55.8 MGD, Atlantic Coastal 19.4 MGD, Mullica 95.3 MGD and Cape May Coastal 24.1 MGD (table 4). Of this total, approximately 25.7 MGD is withdrawn in Egg Harbor, Galloway and Hamilton Townships (18.1, 5.2 and 2.4 MGD respectively), mostly from the Great Egg Harbor River watershed (table 2). In addition, as of June 2003, an additional 7.2 MGD in new allocations were pending before the Department. It should also be noted that based on public water system use near the coast, but not on the barrier islands, summer water use exceeds winter water use by forty percent. The majority of this increase is likely due to outdoor irrigation use and an increase in tourism.

TABLE 2
CURRENT (1999) WATER DEMAND IN THE
EGG HARBOR, GALLOWAY & HAMILTON TOWNSHIPS
BY INDIVIDUAL SOURCE
MILLION GALLONS PER DAY (AVERAGE)

TOWNSHIP/WATERSHED	SOURCE	1999
EGG HARBOR TOWNSHIP		
GREAT EGG HARBOR	Surface	-
	Unconfined	15.2
	Confined	0.5
	Unknown	-
	Domestic	2.4
	SUB-TOTAL	18.1
GALLOWAY TOWNSHIP		
MULLICA/GREAT EGG HARBOR	Surface	-
	Unconfined	2.0
	Confined	0.7
	Unknown	-
	Domestic	2.5
	SUB-TOTAL	5.2
HAMILTON TOWNSHIP		
GREAT EGG HARBOR	Surface	-
	Unconfined	0.7
	Confined	1.0
	Unknown	-
	Domestic	0.7
	SUB-TOTAL	2.4
	TOTAL	25.7

Future water supply demand was estimated by projecting population growth within the study area to the year 2050 using Department of Labor growth projections averaged with the actual growth between 1990 through 2000 (DOL, 2001; DOL 2003). Based on these sources, future population growth within the study area is expected to grow by 9.7 percent per decade. This population growth is not expected to take place uniformly over the entire study area. Egg Harbor, Galloway and Hamilton Townships are expected to experience some of the largest population growth during the planning period (17%, 21.3% and 18.4% per decade respectively). If this rate of growth is realized, each of the three municipalities will more than double in population by 2050 (table 3).

Land use and population growth trends were then equated to water demand estimates yielding a total demand of about 308 MGD by year 2050 (table 5). If the projected population growth in Egg Harbor, Galloway and Hamilton Townships becomes a reality water demand will likely increase by a proportionate amount, meaning by 2050 water withdrawn within these three municipalities will, by themselves, use all of the planning yield in the Great Egg Harbor watershed.

TABLE 3

POPULATION PROJECTIONS FOR
EGG HARBOR, GALLOWAY AND HAMILTON TOWNSHIPS

Area	1990	2000	1990-2000 RATE	2010	2000-2010 RATE	1990-2010 RATE/ DECADE	2020	2030	2040	2050
NEW JERSEY	7,730,188	8,414,350	8.9%	9,062,800	7.7%	8.3%	9,780,900	-	-	-
ATLANTIC COUNTY	224,327	252,552	12.6%	274,400	8.7%	10.7%	303,761	336,263	372,244	412,074
Egg Harbor	24,544	30,726	25.2%	33,399	8.7%	17.0%	39,078	45,720	53,492	62,586
Galloway	23,330	31,209	33.8%	33,924	8.7%	21.3%	41,150	49,915	60,547	73,443
Hamilton	16,012	20,499	28.0%	22,284	8.7%	18.4%	26,384	31,239	36,987	43,793
Total		82,434								179,822

Findings

The key consumers of water in the study area are agriculture, primarily located in the headwater areas, and potable uses primarily near the coast. Both uses impact stream flow: agriculture through consumptive losses and potable uses through depletive losses. Water use along the coast increases by an additional forty percent during the summer, which is the critical period when considering stream base flow. This majority of this increase is likely attributable to outdoor water use and an increase in tourists.

TABLE 4

1990-1996 WATER DEMAND BY USE CATEGORY

SOUTHEASTERN NEW JERSEY STUDY AREA

MILLION GALLONS PER DAY (AVERAGE)

WATER USE	MULLICA			CAPE MAY *			GREAT EGG			SO. BARNEGAT			T
	SW	GW	T	SW	GW	T	SW	GW	T	SW	GW	T	
POWER GENERATION	0	0	0	0	0.4	0.4	0	0.4	0.4	0	0	0	0.8
MINING	0	4.7	4.7	2.2	4.0	6.2	3.9	3.9	7.8	0	0	0	18.7
INDUSTRIAL	0	0.5	0.5	0.0	0.2	0.2	0	1.9	1.9	0	0	0	2.6
COMMERCIAL/ RECREATION	0	0	0	0.0	0.0	0.0	0	0.6	0.6	0	0	0	0.6
POTABLE SUPPLY	0	11.0	11.0	0.0	16.1	16.1	1.1	39.2	40.3	0	16.4	16.4	83.8
IRRIGATION	0	0.3	0.3	0.04	0.3	0.4	0.2	0.4	0.6	0	0	0	1.3
AGRICULTURE	53.9	25.1	79.0	0.0	0.7	0.8	0.4	4.2	4.6	0	0	0	84.4
TOTAL	53.9	41.6	95.5	2.3	21.9	24.1	5.6	50.6	56.2	0	16.4	16.4	192.2

SW = Surface Water GW = Ground Water T = Total

Withdrawals less than 100,000 not included

A comparison of the water supply and existing water demand estimates indicates that both the Great Egg Harbor River and Mullica River watersheds are already over drawn. The portion of Great Egg Harbor watershed recharge located within Atlantic County yields a groundwater planning yield of 22 MGD within Atlantic County's portion of this watershed. Current water use by Egg Harbor, Galloway and Hamilton Townships within the Great Egg Harbor watershed is already at or exceeds this limit (see table 2).

The water demand in the Southern Barnegat watershed is projected to reach its capacity in the year 2030. Water demand in the Cape May Coastal watershed area is also not

expected to reach capacity until about this time. However, salt water intrusion currently affecting the southern part of Cape May County, where water demand is greatest, complicates the water supply strategy for that area.

TABLE 5
WATER DEMAND PROJECTIONS IN THE SOUTHEASTERN NEW JERSEY STUDY AREA
(MILLION GALLONS PER DAY – AVERAGE)

WATER-SHED	1996-2000	1990-2010 WATERSHED GROWTH RATE PER DECADE	2010	2020	2030	2040	2050
Mullica	95.3	10.2%	105	116.4	128.2	141.3	155.7
Cape May	24.1	5.8%	25.5	27.0	28.5	30.2	31.9
Great Egg	55.84	7.6%	60.1	64.7	69.6	74.9	80.6
So Barnegat	19.38	15.3%	22.3	25.8	29.7	34.3	39.5
TOTAL	194.62	9.7%	212.9	233.9	256.0	280.7	307.7

Watt and Johnson (1992) estimate the average baseflow of the Great Egg Harbor River at Folsom to be 85 percent. Therefore, surface water withdrawals and wells pumping from the Kirkwood-Cohansey water table aquifer in the Mullica River and Great Egg Harbor River watersheds are likely resulting in local and/or regional stream flow reductions during the summer and fall, especially when the region is experiencing drought. Circumstantial evidence of this was found during the 2002 drought, when historical low stream flows were recorded in the Great Egg Harbor, Mullica and Oswego Rivers (Navoy, Pers. Comm.). These record low flows were even lower than the previous low flows recorded during the drought of record in the 1960 to 1965 period (see figure 5).

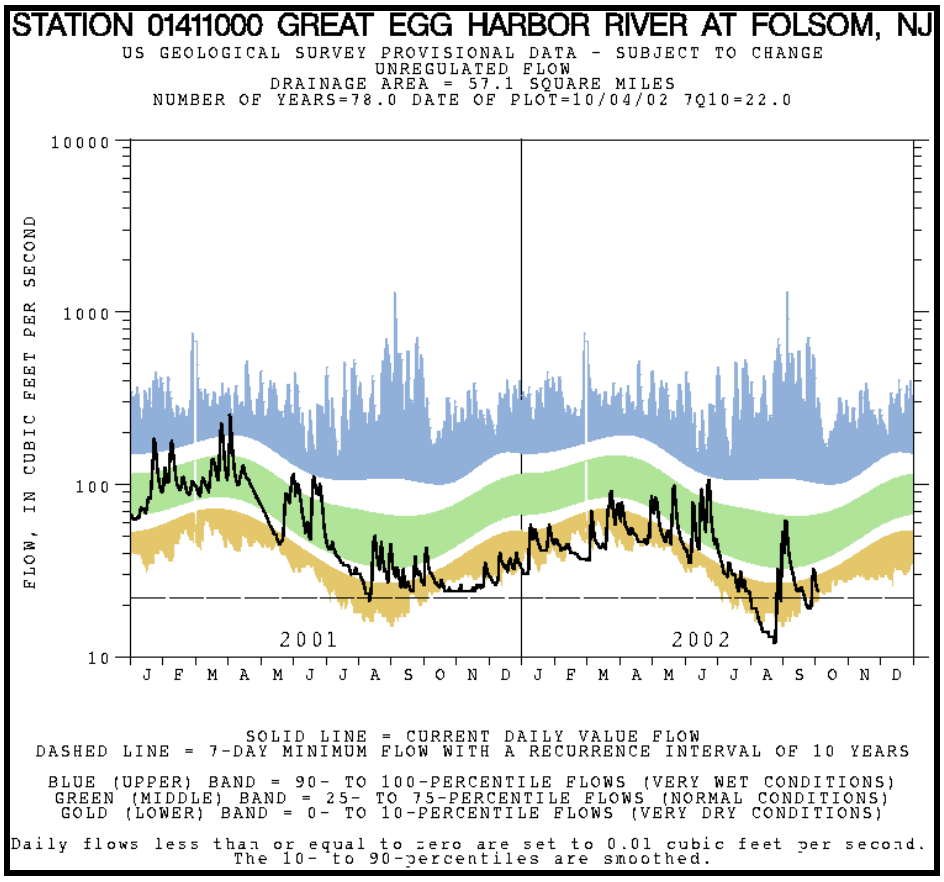

Figure 5 (Source: USGS)

Individually, these withdrawals may not have a distinguishable impact on stream flow, but the cumulative effect of numerous withdrawals is likely to effect or have affected sensitive in-stream and estuarine resources. The planning yield for water supply planning purposes, defined as ten percent of average annual recharge, is intended to account for these cumulative effects. However, in certain circumstances the effect of individual withdrawals on surface water resources may be more severe depending on well location and the rate of pumping.

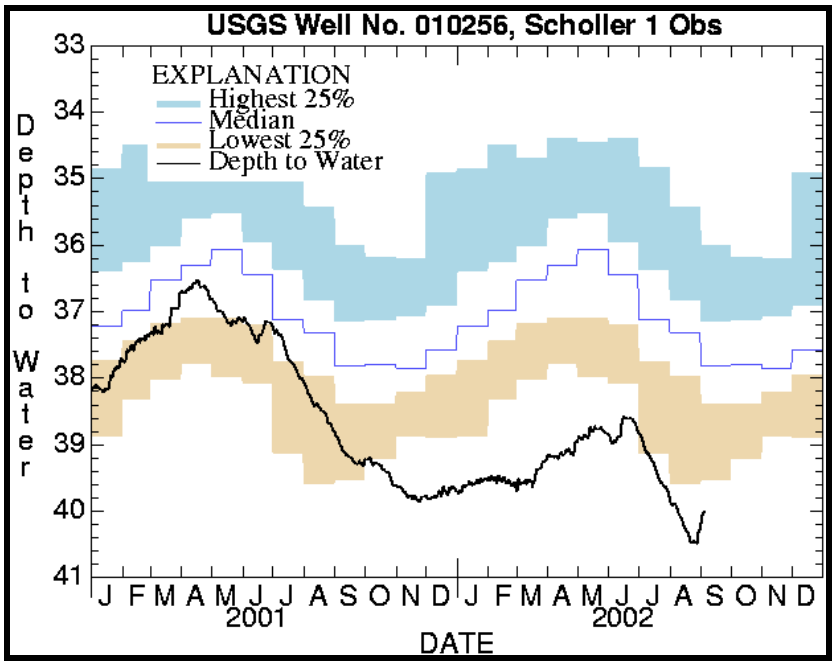

Figure 6. Recent hydrograph and statistical summary of daily mean water levels for each month of the Scholler 1 observation well that is screened in the Kirkwood-Cohansey Aquifer in Hamilton Township, Atlantic County (Source: USGS)

Observation wells used by the U.S. Geological Survey to monitor the Kirkwood-Cohansey aquifer in Hamilton and Egg Harbor Townships showed record low groundwater levels during the 2002 drought (see figures 6 and 7). Several factors may have contributed to this phenomenon including: lower than normal precipitation together with increasing groundwater withdrawals needed to meet water supply demand. However, this impact may not be solely attributable to water table aquifer withdrawals. Increases in impervious cover as well as the inducement of water from the water table aquifers as a result of pumpage from the deeper confined aquifers may further be exacerbating these reductions. The Kirkwood-Cohansey water table aquifer is the primary source of base flow in the study area streams. Consequently, record low water table levels observed in 2002 will also have manifested themselves in severe low stream flow. Even though not solely responsible, withdrawals from the Kirkwood-Cohansey water table aquifer to meet the growing demands in Egg Harbor, Galloway and Hamilton Townships are likely contributing to local stream flow depletion.

While the 2002 observations are not necessarily indicative of a long-term trend, these observations further illustrate the increasing susceptibility of the water resource to stress during periods of lower than average precipitation. However when considered together, the observed water table and stream flow depletion during the 2002 drought being below those recorded during the drought of record, and the fact that current withdrawals exceed the water supply planning capacity of the aquifers it appears that regional water supply demand may already exceed the dependable or sustainable yield of these aquifers. Increases from these existing withdrawals and new withdrawals will exacerbate these conditions.

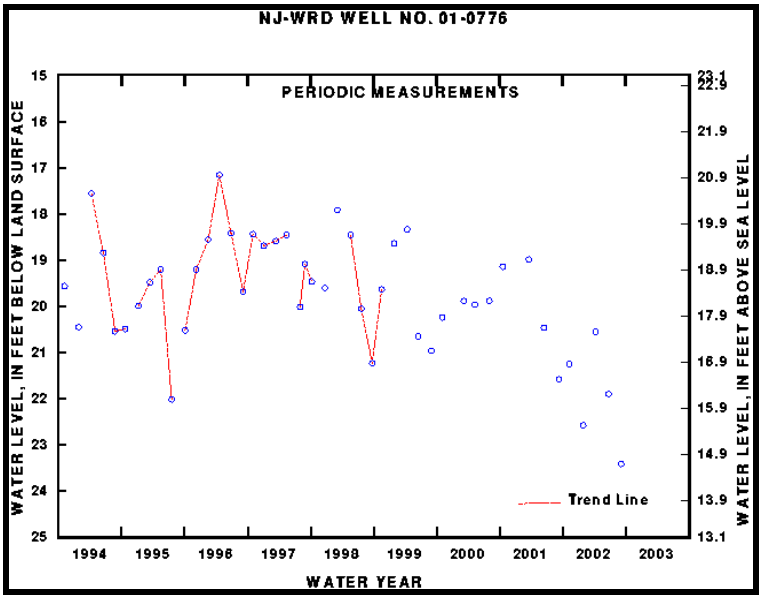

Figure 7. Hydrograph of the FAA Shallow observation well that is screened in the Kirkwood-Cohansey Aquifer in Egg Harbor Township, Atlantic County (Source USGS)

Given the region's reliance on the water table aquifer as a source of drinking water, steps should be taken to protect this source from contamination. Pollution associated with development may threaten the quality of the region's surface water and water table aquifer supplies. Unless efforts are undertaken to control these sources of pollution, the threat will grow as the region continues to develop.

Increases in withdrawals from the deep Atlantic City 800-foot sand confined aquifer throughout the region are resulting in a "mining" effect on the water resource. In essence, the dependable (or sustainable) yield of the aquifer has already been exceeded. Ground water pressure levels throughout the aquifer have continuously declined one to two feet annually as a result of increased pumpage over the decades.[1] The most recent measurements show that pressure levels in this once artesian aquifer, are now more than 100 feet below sea level in the Atlantic City area (see figure 8), and the cone of depression where water pressure levels are well below sea level stretches far into Cape May and Ocean Counties (USGS, 2002). This has resulted in a reversal in the direction of ground water flow; fresh ground water is now being replaced by saltwater. Consequently, saltwater is slowly migrating toward wells on the barrier islands.

[1] Ground water pressure levels (or the potentiometric surface) refers to the elevation or level that water in a confined aquifer would rise if a well were installed into it. The potential for saltwater intrusion increases when ground water pressures are substantially below sea level in close proximity to the freshwater/saltwater interface in a confined aquifer in a coastal area.

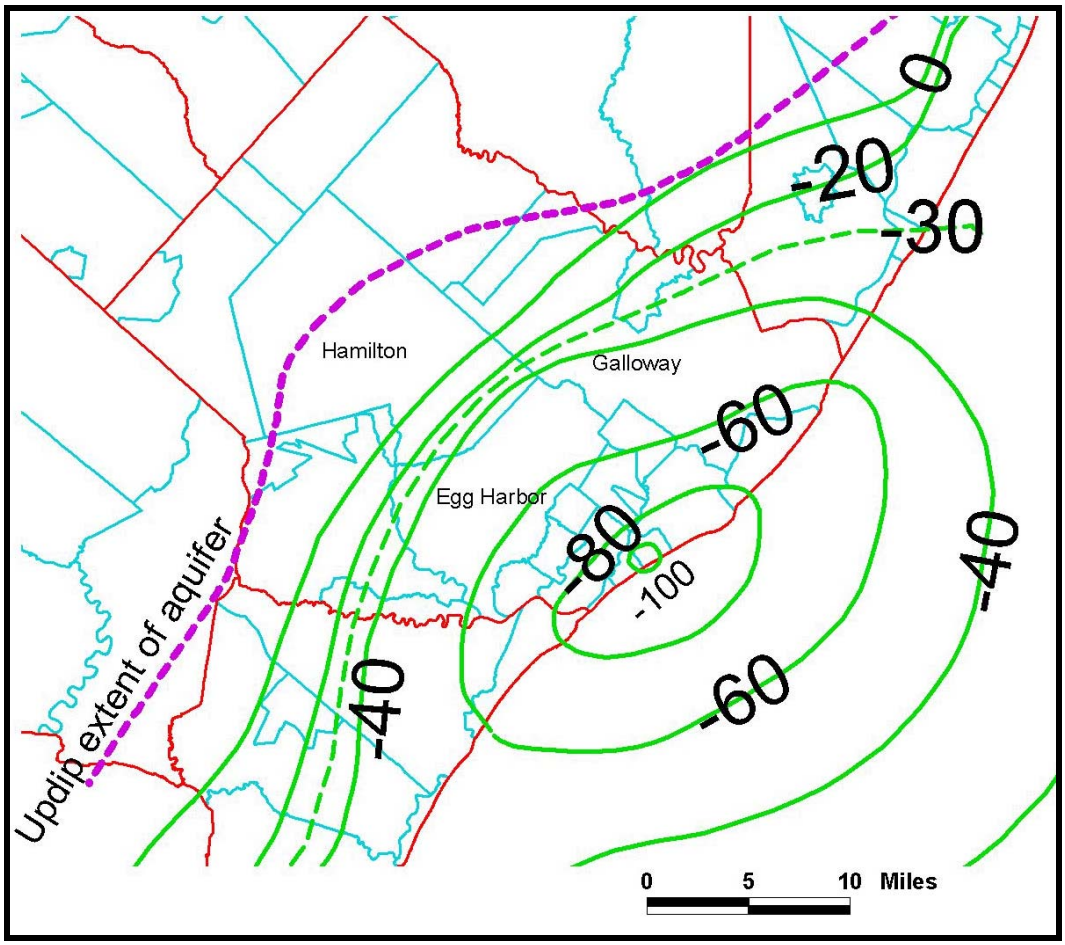

Figure 8 Potentiometric surface in the Atlantic City 800-foot sand aquifer showing the depth and extent of the impact on ground water pressure levels due to water supply pumping.

Wells in southern Cape May County will be affected long before wells in the Atlantic City area. Pumping from this aquifer in the Atlantic City area is likely exerting some accelerating influence on the salt front movement in Cape May County (Navoy, Pers. Comm.). While it will be several decades before saltwater affects the Cape May County Atlantic City 800-foot sands wells, these conditions are presumptive evidence that demand is exceeding availability. Due to limited data, it is unknown at this time when wells located along the barrier islands in Ocean County would be placed at risk.

Should additional water in the study area be needed, the Atlantic City 800-foot sand is the aquifer of choice for several reasons. The distance between the location of the salt front and pumping centers in the Atlantic City 800-foot sands, and the projected time of travel before the salt front reaches any public supply well indicates that this resource could be tapped for several decades. The depth of the aquifer and its confined nature in eastern Atlantic County indicates that effects of pumping will be spread over a large area, decreasing the likelihood of acute stream flow depletion in any one stream. However, the Atlantic City 800-foot sand aquifer is in communication with the Kirkwood-Cohansey aquifer in the western part of Atlantic County. Research suggests that leakage from the Kirkwood-Cohansey into the Atlantic City 800-foot sand is increasing due to pumping along the coast. Therefore, an increase in pumping in the Atlantic City 800-foot sand will exert negative influence on the surface water resources and cannot be considered an unlimited resource.

Table 6
Wastewater Reuse Potential (2001 average flows based on DMR reports)

Atlantic County	27.75 MGD
Southern Ocean	6.96 MGD
Cape May County	18.25 MGD

Outdoor summertime water use in the region is significant, increasing winter demand by about forty percent. A significant reduction in this seasonal water demand may be achieved through water conservation and beneficial reuse of wastewater (table 6). Atlantic County alone discharges 27 MGD of wastewater to the ocean. Cape May County discharges 18 MGD of wastewater into the ocean. With additional treatment and infrastructure this water could be used to replace groundwater withdrawals for irrigation uses thereby having an immediate impact on leveling the variation in seasonal demand.

Conclusions and Recommended Action

Based on this analysis, NJDEP concludes that this region will continue to experience both immediate and long-term problems associated with its water supply. Among the more immediate problems are stream flow depletion during periods of below normal precipitation as a result of surface and ground water withdrawals from the water table aquifer. While a direct cause and effect relationship cannot be quantified by this report, circumstantial evidence of depressed water table elevations and lowest recorded stream flows within the region's streams during the 2002 drought cannot be ignored. This evidence combined with the fact that water demand in the study area already exceeds the planning yield of the supply, accentuates the need to take reasonable action now to slow the rate of increasing withdrawals. In addition, due to its location near the land surface,

the Kirkwood-Cohansey Aquifer is more vulnerable to contamination that could threaten the quality of the drinking water from this supply.

An additional long-term problem is the migration of saltwater into the deeper confined aquifer due to groundwater pumping resulting in declines in the potentiometric surface in the Atlantic City 800-foot sand aquifer. Wells in Cape May County will likely be threatened first possibly followed by Ocean County wells. Even so, these wells are not anticipated to be impacted for decades even under increased pumping. However, the movement of the 250 mg/l chloride isochlor is an indication that the sustainable yield of this aquifer may already be exceeded.

Based on acceleration of the salt front in the confined aquifer in Cape May County, record low stream flows and withdrawals exceeding the planning yields of the area's water table aquifers, there is cause for concern over the ability of the region's water resources to meet anticipated future water demand while protecting the aquatic ecosystem. These threatened resources may meet the criteria for designation now or in the future as an Area of Critical Water Supply Concern as provided in N.J.A.C. 7:19-8.2, but additional study is needed to make the required findings. Among the required findings are:

> "1. Shortage of surface water due to diversions from surface or ground water sources which leave insufficient surface water for permitted, certified, or registered diversions or for environmental protection purposes within a drainage area of at least ten square miles.
> 2. Shortage of ground water due to diversions exceeding the long-term, safe or dependable yield of an aquifer in an area of at least ten square miles. The Department may demonstrate such a shortage by a verified mathematical ground water model, or if such a model is unavailable, by one or more of the following:
> iii. A reduction of the average potentiometric surface in a confined aquifer such that the 30 foot below mean sea level contour is within five miles of salt water or intersects the 250 part per million chloride isochlor;"

INTERIM PLAN

Since the comprehensive plan will not be completed for at least three years, the NJDEP will coordinate with the stakeholders of the region to conserve ground water for potable uses. At the same time the Department will seek discourage the use of groundwater for new non-potable, consumptive uses such as lawn and landscape irrigation by bolstering the current policy of using lowest quality water for new or expanded non-potable (non-essential) water uses (N.J.A.C. 7:19-2.2(g). Essentially, the Department will not permit new allocations for non-potable water use, where alternative sources of water can be used to meet demand. To that end, the Department will require the beneficial reuse of wastewater for irrigation, unless it is cost or environmentally prohibitive. In these cases, a documented equivalent reduction from an existing use from the same resource will be required before an application for an allocation will be permitted. An example of such a "trading" system would be for a non-potable water user to work with another existing

non-potable water user to switch to an alternative water source, such as beneficial reuse where the existing water user is better situated to take advantage of beneficial reuse. To facilitate these arrangements, NJDEP will investigate the possibility of allowing a non-potable water user to sell their allocation upon switching to an alternate water supply such as wastewater reuse. The sale of an allocation would help offset increased infrastructure and treatment costs associated with wastewater reuse.

Existing summertime outdoor water use is significant in the region. The Department will work closely with the Atlantic County Board of Chosen Freeholders and the municipalities in the region to initiate mandatory, non-drought outdoor water conservation measures. These measures may include the required installation of rain sensors on automatic sprinkler systems, odd-even water restrictions, lot clearing restrictions and other measures as appropriate. In addition, the Department will promote landscaping measures that would reduce irrigation demands including xeric landscaping.

In Atlantic County water supply from the Atlantic City 800-foot sand aquifer is preferable to the Kirkwood-Cohansey aquifer since effects from pumping the Atlantic City 800-foot sands are distributed over a wider area and the adverse impacts associated with its use are less immediate. Therefore, the Department will not permit new allocations that utilize the Kirkwood-Cohansey aquifer unless it is determined that no viable water supply sources are available and that the proposed use will not result in any adverse ecological impact on the Pinelands Area. This policy is consistent with the Pinelands Comprehensive Management Plan at N.J.A.C. 7:50-6.86(e).

Pollutant sources associated with development are threatening the quality of the region's surface water and water table aquifer supplies. The threat will grow as the region continues to develop. NJDEP will work closely with Atlantic County and local governing bodies to initiate source water protection through local zoning once the source water assessments have been completed later this year.

NJDEP will immediately take steps to initiate stakeholder partnerships to implement this strategy. Because the water supply problems transcend multiple counties and municipalities, NJDEP and the stakeholders should consider effectuating an institutional entity or quasi-government arrangement to more adequately manage the region's water resources.

LONG-TERM STRATEGY

The NJDEP intends to initiate the development and implementation of a comprehensive regional water supply plan for the southeastern New Jersey Study Area in coordination with the Pinelands and Cape May studies being performed under (P.L. 2001, C. 165). Long-term water supply planning for the Atlantic City 800-foot sand aquifer, as described above, must be coordinated with the water supply studies currently being conducted in Cape May County and Ocean County since the barrier islands in southeastern New Jersey all share this same supply. Long-term water supply planning for the water table aquifers in the Southeastern New Jersey Study Area will be developed

with a stated objective of maintaining stream flow conditions that are protective of aquatic resources during future drought periods. The stated objective in the Atlantic City 800-foot sand aquifer should be to permanently "stabilize" the salt front at pre-determined locations in southern Cape May and Ocean counties before existing pumping centers are impaired.

To accomplish these objectives this plan will need to assess: 1) residential, commercial and agricultural conservation initiatives, 2) wastewater reclamation, 3) stormwater and treated wastewater recharge, 4) the restriction of regional sewage systems that facilitate the transfer of water from the mainland and discharge it to the ocean, and 5) alternative water supplies including aquifer storage and recovery and conjunctive uses of surface and deep aquifer resources that are capable of increasing sustainable yield while eliminating the undesirable impacts associated with stream flow loss. This plan is expected to take three to four years to complete.

The NJDEP will facilitate a participatory process to develop and implement the regional water supply plan. Affected stakeholders (purveyors, wastewater officials, local and county planners, environmental groups, agricultural industry, etc.) in Southeastern New Jersey Study Area will be invited to work together to reach shared and equitable goals, and play a major role in implementing a plan that ensures the long-term sustainability of the region's water supply. This implementation strategy would: 1) investigate systematic implementation of initiatives to reduce current and anticipated demand from existing wells in the aquifer through water conservation, wastewater reuse and judicial land use planning efforts that considers and reduces the effects on the supply, and 2) identify and set aside alternative water supplies to meet future demands.

NJDEP notes that additional studies are on-going including the development of water budgets and the ecological flow goals project. When available, the results of these studies will better inform the interim strategy presented here. The NJDEP intends to revisit and adjust the conclusions and recommended actions of this report as better information becomes available.

References Cited

Hoffman, Jeffrey L., and Lieberman, Seven E., 2000, New Jersey Water Withdrawals 1990-1996: New Jersey Department of Environmental Protection, Appendix C, Table C14.

Navoy, Anthony S., United States Geological Survey, Assistant District Chief of the New Jersey District, Personal Communication 2003.

NJDEP, 1996, Water for the 21st Century: The Vital Resource New Jersey Statewide Water Supply Plan: New Jersey Department of Environmental Protection, Office of Environmental Planning.

NJDOL, 2001, NJSDC 2000 Census Publication – Total Residential Population New Jersey Counties and Municipalities: 1980, 1990 and 2000: New Jersey Department of Labor, State Data Center.

NJDOL, 2003, Projections of Total Populations by County, New Jersey 1998-2015: New Jersey Department of Labor.

NJGS, 2001, Groundwater Flow and Quality in the Atlantic City 800-foot Sand, New Jersey, New Jersey Geological Survey, Geological Survey Report GSR 41.

Pinelands 1980, New Jersey Pinelands Comprehensive Management Plan: Pinelands Commission.

Stockton 1979, Natural and Cultural Resources of the New Jersey Pine Barrens: Stockton State College, Center for Environmental Research; Rutgers University; New Jersey Department of Environmental Protection.

USEPA, 1997, Alteration of Natural Flow Regimes – A Nationwide Natural Resource Issue as reported by the Nation's Estuary Programs: United States Environmental Protection Agency.

USGS, 2002, Hydrogeologic Framework, availability of Water Supplies, and Saltwater Intrusion, Cape May County, New Jersey: United States Geological Survey, Water Resource Investigations Report 01-4246.

Watt, M. K., and Johnson, M. L., 1992, Water Resources of the Unconfined Aquifer System of the Great Egg Harbor River Basin, New Jersey, 1989-1990: U.S. Geological Survey, Water Resources Investigations Report 91-4126.